US 20050278876A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0278876 A1**

Roth et al. (43) **Pub. Date: Dec. 22, 2005**

(54) **OSCILLATING BRUSHHEAD ATTACHMENT SYSTEM FOR A PERSONAL CARE APPLIANCE**

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(21) Appl. No.: **10/873,352**

(22) Filed: **Jun. 22, 2004**

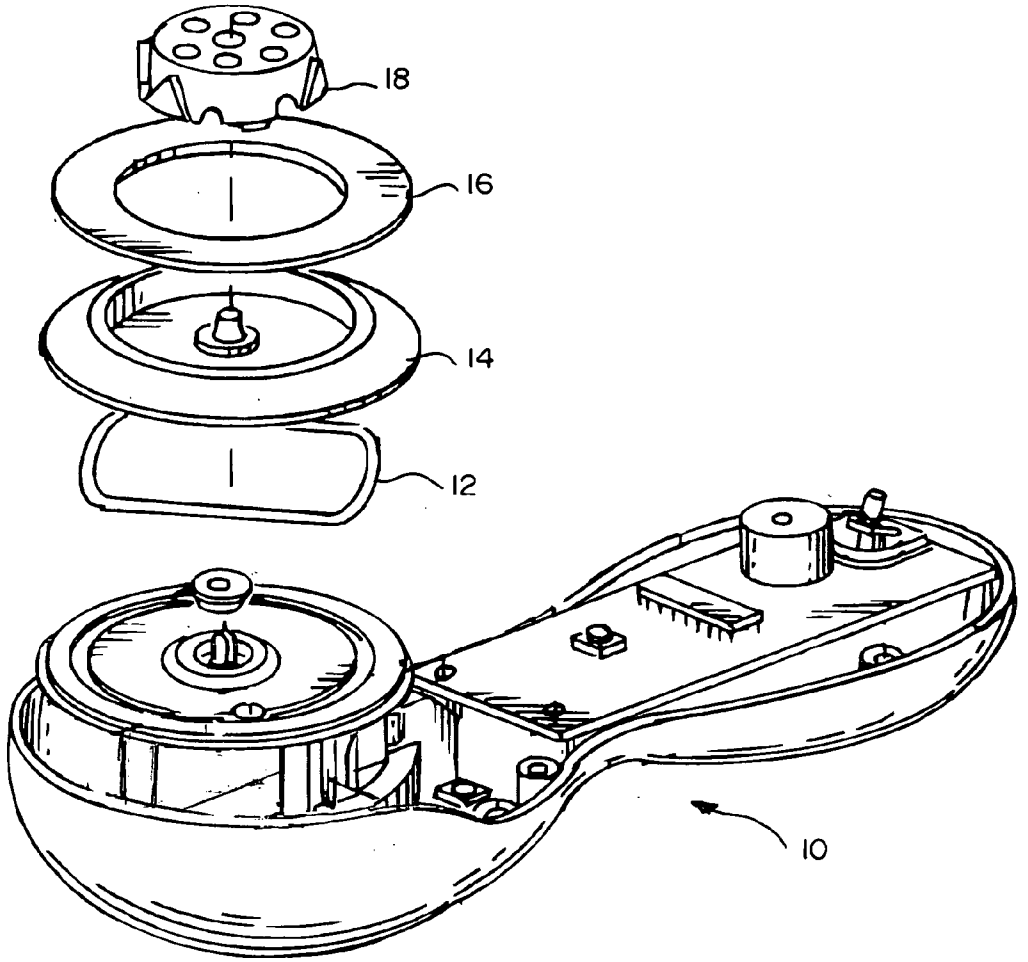
Publication Classification

(51) **Int. Cl.**[7] **A46B 13/02**

(52) **U.S. Cl.** **15/28**

(57) **ABSTRACT**

The brushhead attachment system includes a hub member which is secured to a drive shaft of a personal care appliance for oscillating action. The hub member includes a number of spaced locking elements in the form of protrusions around the periphery thereof. An annular outer brushhead portion with a first group of bristles includes a plurality of spaced grooves in the outer surface thereof which mate with extending pins in the body of the appliance for insertion and removal of the outer brushhead portion. An inner brushhead portion is configured to fit within the annular opening of the outer brushhead portion and includes a plurality of depending legs which mate with the protrusions on the drive member for resulting oscillating action of the inner brushhead portion when the drive member oscillates, at least some of the legs having latch elements which fit onto an interior lip of the outer brushhead portion in such a manner that the inner and outer brushhead portions may be installed and removed as a unit, while permitting the inner brushhead portion to be freely rotatable relative to the outer brushhead portion.



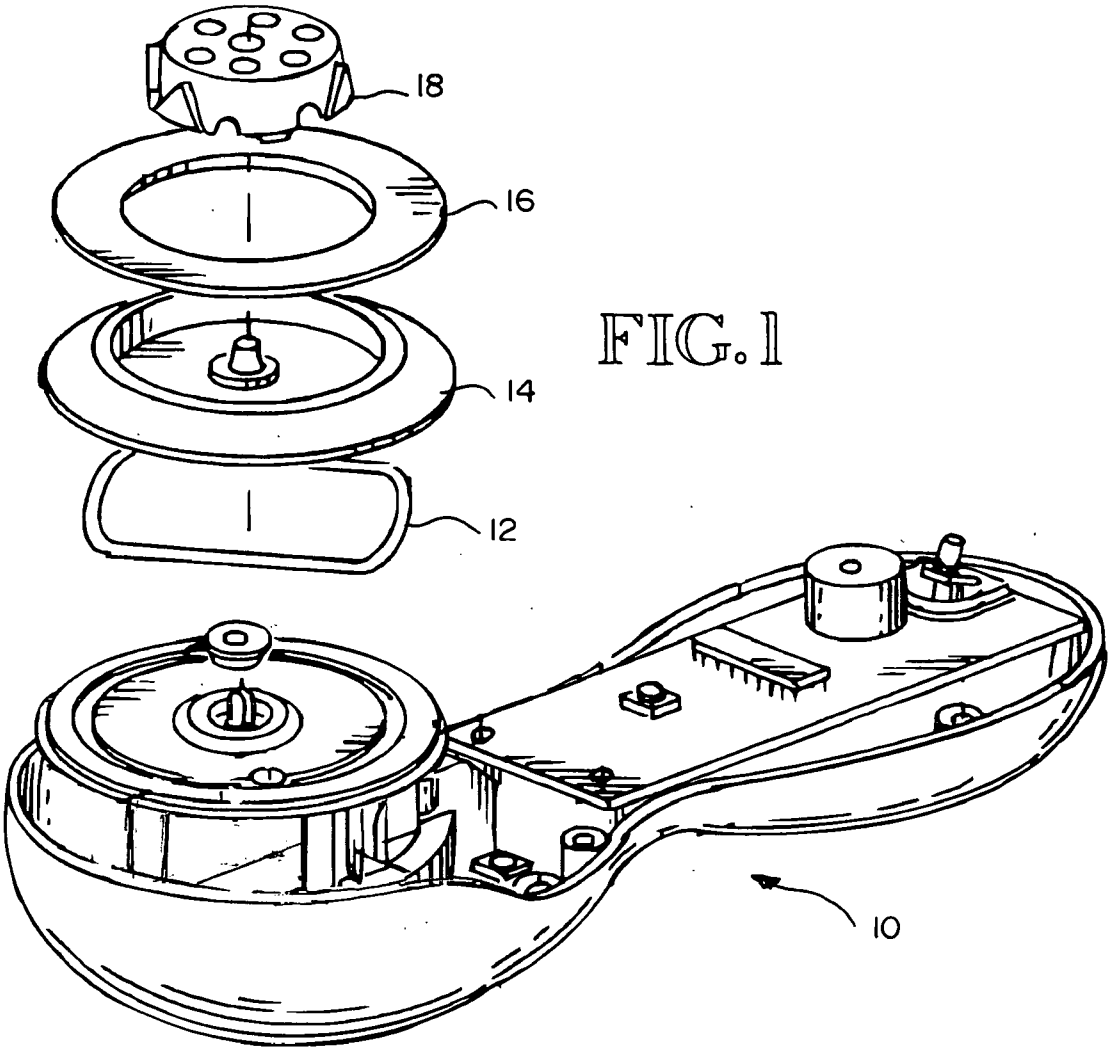


FIG. 1

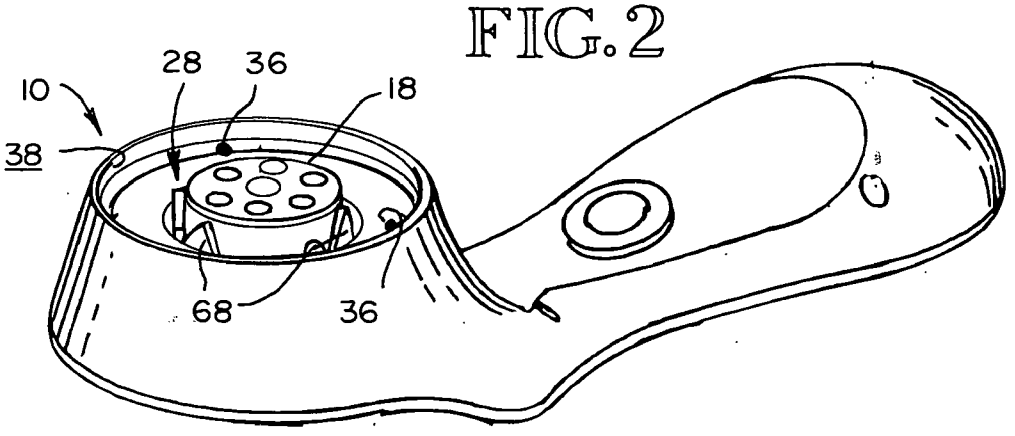


FIG. 2

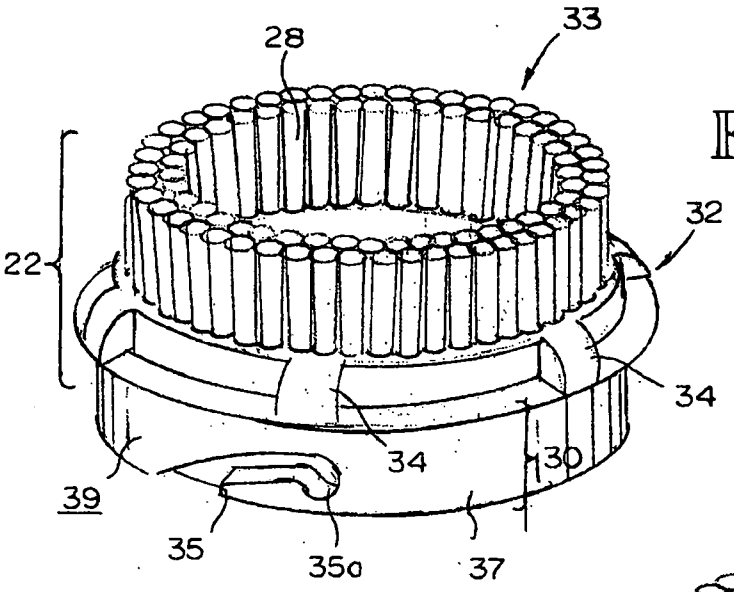


FIG. 3

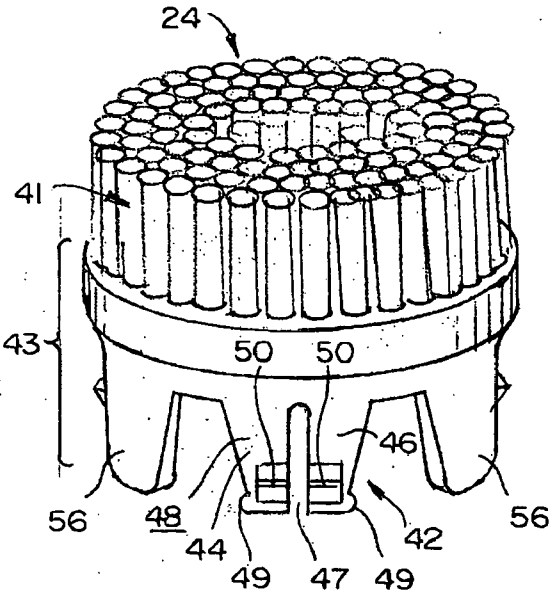


FIG. 4

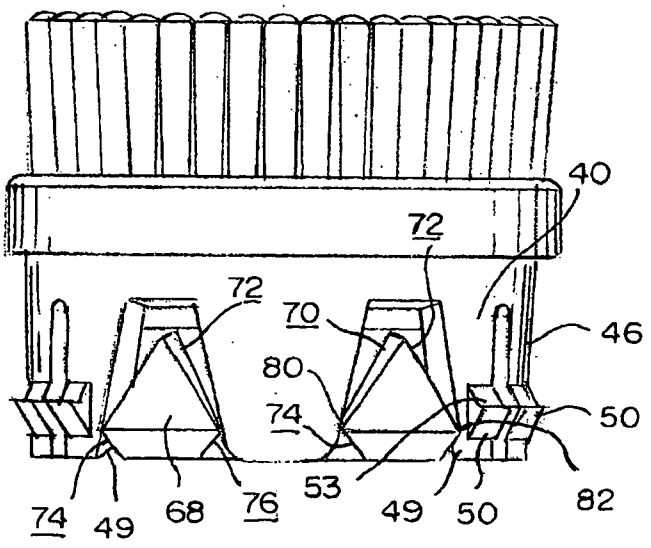


FIG. 6

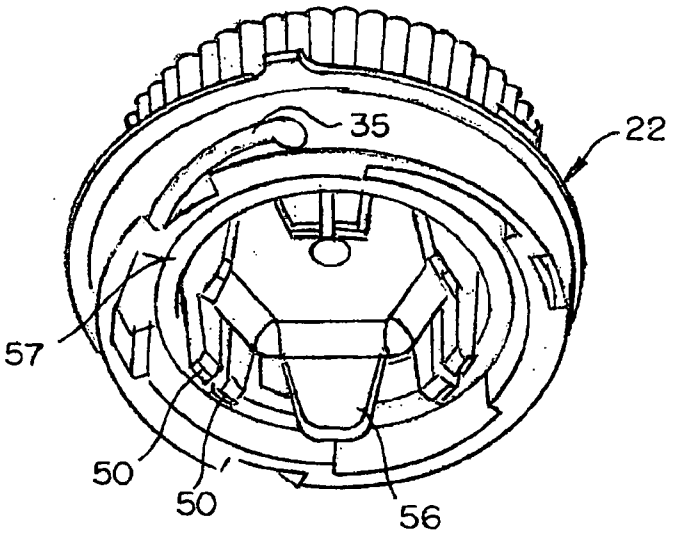


FIG. 5

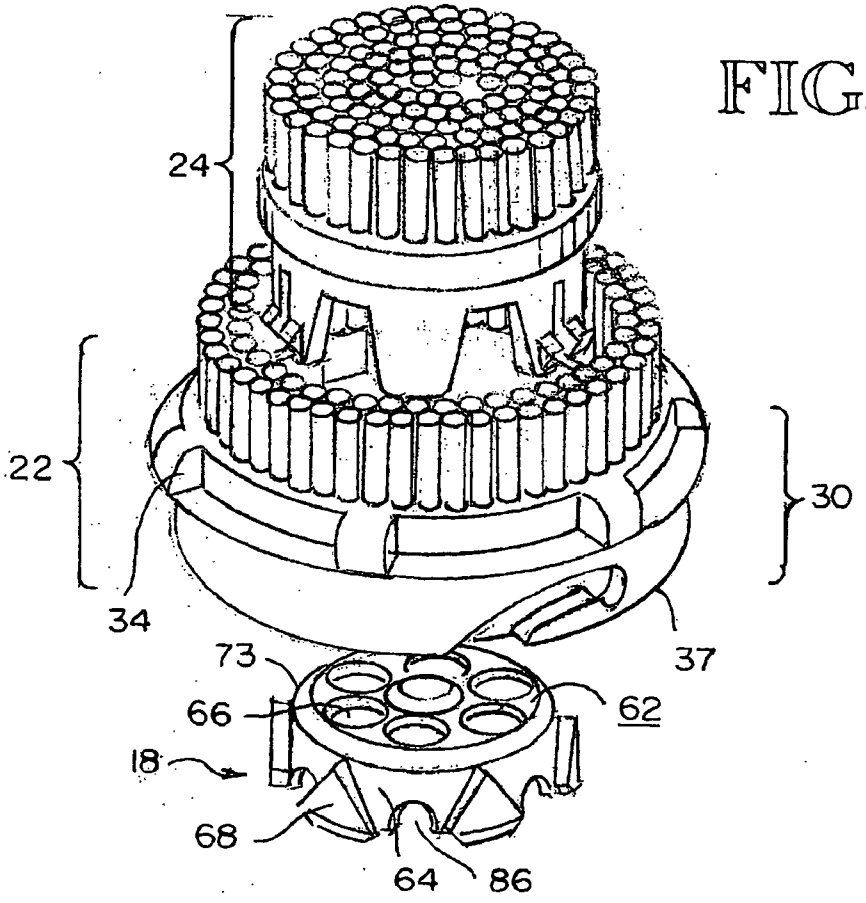


FIG. 7

OSCILLATING BRUSHHEAD ATTACHMENT SYSTEM FOR A PERSONAL CARE APPLIANCE

TECHNICAL FIELD

[0001] This invention relates generally to large brushhead structures for a personal care appliance, such as a skin cleaning apparatus, and more specifically relates to an attachment system for such a brushhead to a driving member in the appliance.

BACKGROUND OF THE INVENTION

[0002] In personal care appliances, including those having a relatively large brushhead assembly, such as those used for cleaning skin, the brushhead must be readily removable and installable by a user, because of regular replacement requirements, and when installed, must have a solid, positive connection with a drive member for the appliance, such as a rotating shaft, with no or little loss of motion between the drive member and the brushhead. With conventional brushheads, these objectives are accomplished with a variety of attaching structures, including screw-on connections, or snap connections which have tabs to mate with matching openings in the body of the appliance.

[0003] However, with complicated brushhead designs, reliable and convenient attachment becomes more problematic. For instance, in a brushhead having two or more parts, with each operating differently, such as different motions, there is difficulty in maintaining the two parts in the required relationship to produce the different actions, while also permitting installation of the complete brushhead into the appliance body with a convenient, single easy action. In the embodiment disclosed herein, one portion of the brushhead is movable in operation of the appliance, while the other portion remains stationary. In this particular arrangement, the movable part must engage the drive member, while the other part is positioned and held such that it does not move with the drive member, yet the two separate parts must be removable and installable as a single unit.

SUMMARY OF THE INVENTION

[0004] Accordingly, the present invention is a brushhead assembly attachment system for a personal care appliance, comprising: a hub member adapted to be secured to a driven shaft of a personal care appliance, the hub member including a plurality of locking elements around the periphery thereof; an outer brushhead portion having a first cleaning member extending therefrom, the outer brush assembly having a connecting structure for removably joining the outer brushhead assembly to the personal care appliance; and an inner brushhead portion having a second cleaning member extending therefrom, configured to fit with the outer brushhead assembly, wherein the inner brushhead assembly includes depending legs, at least some of which mate with the locking elements on the hub member, such that oscillating movement of the hub member results in similar movement of the inner brushhead member, wherein at least some of the depending legs are configured to removably latch onto a portion of the outer brushhead portion, providing a joining relationship therebetween, wherein the inner brushhead portion and the outer brushhead portion are configured relative to each other and to the hub member such that attaching the outer brushhead portion to the appliance body by means of said connecting structure results in both connection of the outer brushhead portion to the appliance body and connection of the inner brushhead portion to the hub member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] **FIG. 1** is a partially exploded view of a personal care appliance with which the brushhead attachment system of the present invention can be used.

[0006] **FIG. 2** shows the appliance of **FIG. 1**, ready to receive a brushhead assembly.

[0007] **FIG. 3** is a schematic view of an outer stationary portion of the brushhead assembly system described herein.

[0008] **FIG. 4** is a schematic view of an inner movable portion of the brushhead assembly described herein.

[0009] **FIG. 5** shows the connection between the inner and outer brushhead portions of **FIGS. 3 and 4**.

[0010] **FIG. 6** shows the connection between the inner portion of the brushhead assembly and a driving hub of the appliance.

[0011] **FIG. 7** is an exploded view showing the relationship of the inner and outer portions of the brushhead assembly and the driving hub portion of the appliance.

BEST MODE FOR CARRYING OUT THE INVENTION

[0012] **FIGS. 1 and 2** show a personal care appliance **10** which is described in more detail in co-pending application titled "Motor Providing Oscillating Action for a Personal Care Appliance" and "Brush Configuration for a Powered Skin Cleansing Brush Appliance", both owned by the assignee of the present invention, the contents of which are hereby incorporated by reference. As shown, personal care appliance **10** is for skin cleaning applications, particularly facial skin. However, appliance **10**, as well as the brushhead attachment mechanism shown and described herein, can be used in a variety of other applications, including other skin care applications, such as acne and blackhead treatment; athlete's foot treatment; calloused skin and psoriasis treatment; treatment of razor bumps and related skin applications, such as wound cleansing and treatment of slow or non-healing wounds; scalp cleansing and chemical peel procedures, and shaving cream applicators.

[0013] The personal care appliance **10** includes an oscillating motor structure in the body thereof which drives an armature through a total angle of 8°-26°, at a frequency in the range of 120-220 Hz. This angle can be varied, however, depending upon the particular application. The personal care appliance **10** includes a wave washer **12** above a motor bracket **13**, the washer **12** providing a spring action directed upwardly in **FIG. 1**. Positioned on top of wave washer **12** is a seal **14** which protects wave washer **12**. An interference washer **16** provides a low friction interface between seal **14** and the brushhead assembly, as discussed in detail below. A driving hub **18** is attached (locked) to the top end of the armature drive member in the appliance and oscillates therewith. Drive hub **18** is particularly configured for use with the brushhead assembly and is part of the overall attachment system for the brushhead assembly to the appliance.

[0014] Referring now to **FIGS. 3 and 7**, the brushhead attachment mechanism includes three portions, drive hub **18**, an outer brushhead portion **22**, which remains stationary during operation of the appliance, and an inner brushhead portion **24** which oscillates through a selected angle during operation of the appliance. The inner brushhead portion **24** has an operative relationship with drive hub **18** such that as drive hub **18** oscillates through a selected angle, so does inner brushhead portion **24**.

[0015] In the embodiment shown, outer brushhead portion **22** is annular, with an outside diameter of approximately 1.975 inches, with a central opening **28**. Outer brushhead portion **22** includes a base portion **30** with a rim **32** around the top periphery thereof which includes a plurality of spaced finger grips **34**, which helps the user in the installation and removal of the brushhead assembly.

[0016] Extending upwardly from base portion **30** are outer brushhead bristles **33**, which in the embodiment shown, are two concentric, adjacent, complete bristle tuft rings. The outer ring of bristles has a diameter of approximately 1.53 inches, while the diameter of the inner ring of bristles is approximately 1.39 inches. The arrangement of the bristles is circular, which is preferred, although not necessary.

[0017] Arranged in the exterior surface of the outer brushhead portion are three pin grooves **35**, separated by 120°. Matching pins **36** on inner surface **38** of a boundary wall defining the opening for the brushhead assembly provide the desired mating relationship between outer brushhead portion **22** and the appliance body **10**. Pin grooves **35** shown in **FIG. 3** are configured to permit the outer brushhead portion **22** to be positioned within the opening in the appliance body **10** such that pins **36** on inner surface **38** are at the entry point of pin grooves **35**. Pin grooves **35** extend at a small upward angle (toward the bristles) in the exterior surface **39** of the outer brushhead portion **22** as they also extend peripherally, approximately 1.1 inches.

[0018] At the end of each pin groove **35** is a small portion **35***a* which angles downwardly toward lower edge **37** of base **30** of the outer brushhead portion **22**. This arrangement provides an "over-travel" capability for outer brushhead portion **22** as it is moved onto the appliance body **10**, and assists in obtaining a secure, solid physical relationship between the inner brushhead portion **24** and the drive hub **18**, as explained in more detail below.

[0019] Inner brushhead portion **24** is shown in more detail in **FIG. 4**. It has a generally circular configuration and is arranged to fit into the central opening **28** of outer brushhead portion **22**. There could be a gap (space) between the bristles and the inner and outer brushhead portions, in the range of 0.050-0.125 inches, preferably 0.084 inches. Inner brushhead portion **24** includes a plurality of inner brushhead bristles **41** which extend upwardly from a base portion **43**, with the bristles **41** arranged in a circular pattern covering the entire upper surface of base portion **43**. The inner brushhead portion **24** in the embodiment shown includes two sets of depending legs on the outer periphery thereof. The first set of three legs **42-42**, spaced at 120° intervals, each leg comprising a pair of snap portions **44** and **46**, defined by a slot **47** which extends down the middle of each snap leg **42**.

[0020] The two snap portions of each snap leg are configured and arranged to slightly flex toward each other during installation of the inner brushhead portion **24** on the driving hub **18**, with the outside edges of the free tips of the snap portions **44**, **46** having outward bulges **49-49** which snap back (with the snap portions) after they pass over a pointed portion of the drive hub **10**, as explained in more detail below, helping to tightly engage the drive hub **18** and retain the inner brushhead portion **24** on drive hub **18**.

[0021] Extending outwardly from outer surface **48** of each snap portion is locking snap elements **50**. Locking snap elements, as shown in more detail in **FIG. 6**, are triangular-shaped elements, which include a slightly V-shaped upper surface **53** thereof, assisting in aligning and latching the inner brushhead portion **24** to the outer brushhead portion **22**, as described in more detail below.

[0022] The inner brushhead portion **24** further includes a second trio of spaced drive legs **56-56**. Drive legs **56** alternate with snap legs **42** around the periphery of inner brushhead portion **24** and are also separated by 120° intervals. Drive legs **56** taper slightly from their base to their free ends, which are rounded, designed to provide a close tolerance fit between them and the drive hub.

[0023] **FIG. 5** shows the attachment arrangement between inner brushhead portion **24** and outer brushhead portion **22**. Snap legs **42** and drive legs **56** of the inner brushhead portion **24** are moved down into annular opening **28** of the outer brushhead portion, with snap legs **42** being moved slightly inwardly in the process. When inner brushhead portion **24** is moved into the outer brushhead portion a sufficient distance, the locking snap elements **50** on each of the snap portions **44** and **46** clear a circular lip **57** on the internal surface of the outer brushhead portion **22** and then rebound slightly outwardly, underneath leg **57**. This action joins the two brushhead portions together. The inner brushhead portion **24** may be separated from the outer brushhead portion **22** by forcing the snap portions **44**, **46** inwardly until they clear lip **57**, at which point the inner brushhead portion **24** is separated from the outer brushhead portion **22** and can be lifted clear of the outer brushhead portion **22**.

[0024] When the two brushhead portions are joined together, as described above, the inner brushhead portion **24** cannot fall off/away from the outer brushhead portion **22**, but is free to rotate relative to the outer brushhead portion **22**. This is an important structural feature of the brushhead attachment arrangement disclosed herein.

[0025] **FIGS. 6 and 7** shows the physical connection between the inner brushhead portion, in particular, snap legs **42-42** and drive legs **56-56** and drive hub **18**. Drive hub **18**, as previously indicated, is generally circular in configuration, with an upper surface **62**, a depending circular wall **64** and a series of diamond-shaped projections **66** on the wall at spaced intervals, separated by clearance space into which the snap legs **42** and drive legs **56** can fit. In the embodiment shown, drive hub **18** includes a number of openings **66** in the upper surface **62** thereof, to facilitate cleaning and draining of the bristles in the outer and inner brushhead portions. Circular wall **64** is tapered slightly outwardly from top to bottom to produce a splaying effect on all the legs of the inner brushhead portion **24**, to assure a snug fit between the inner brushhead portion **24** and the drive hub **18**.

[0026] The diamond-shaped projections **68** on the wall **64** each include two angled upper edge surfaces **70**, **72** which

come to a point at the top edge **73** of wall **64**. At the lower end of edge surfaces **70** and **72** are lower edge surfaces **74** and **76** which angle inwardly toward each other over a short distance to lower edge **78** of drive hub **18**. The diamond-shaped projections **68** thus have two maximum width points **80** and **82** which define the maximum width of the projections, located a short distance above the lower edge of the drive hub **18**.

[**0027**] Further, semi-circular openings **86** are defined in wall **64**, between successive projections **68** around the periphery of the hub to aid in cleaning and drying.

[**0028**] The configuration of the projections **68** in association with the configuration of the two sets of depending legs **42**, **56** on the inner brushhead portion **24** provide a reliable and secure attachment between drive hub **18** and the inner brushhead portion **24**, such that there is little or no lost motion between drive hub action and the inner brushhead action.

[**0029**] The two sets of legs **42**, **56** perform distinctly different functions as described herein, with the snap legs **42** primarily latching the two brushhead portions together and the drive legs **56** transferring the rotational energy of the hub to the brushhead.

[**0030**] Each drive leg **56** contacts the maximum width points **80**, **82** of two adjacent projections on the drive hub, providing efficient transfer of rotational movement, with an interference fit therebetween. As indicated above, snap-legs **42** include bulge portions **49** at the tips thereof which move slightly outwardly with the snap portions **44**, **46** after they pass maximum width points **80** and **82** of the projection. This arrangement also helps to provide a reliable connection between drive hub **18** and the inner brushhead portion **24**.

[**0031**] As indicated above, outer wall **64** of drive hub **18** is tapered relative to all the depending legs of the inner brushhead portion **24**, so that the legs tend to be forced outwardly as the inner brushhead portion **24** is moved downwardly onto the drive hub **18**, again ensuring a snug, reliable fit between drive hub **18** and the inner brushhead portion **24**. The combination of the diamond configuration of projections **68**, the tapered wall **64** of the drive hub **18**, and the configuration of the two sets of legs **42** and **56** of the inner brushhead portion **24** provide a reliable, tight, interference fit between the inner brushhead portion **18** and the drive hub, so that both an efficient transfer of rotational motion and secure retention of the two brushhead portions is provided.

[**0032**] An important aspect of the brushhead attachment system disclosed herein is the arrangement by which the brushhead assembly as a whole (the outer and inner portions) is installed into the appliance, while at the same time producing the desired structural connection between the drive hub **18** and the inner brushhead portion **24** described above when the installation is made. This is accomplished by the pin and pin groove arrangement between the appliance body **10** and the outer brushhead portion **22** and the relative position of the joined inner and outer brushhead portions **22**, **24** and the drive hub **18**.

[**0033**] The complete brushhead assembly is initially positioned in the corresponding opening in the appliance body, toward drive hub **18**, which is secured to the oscillating spring drive member of the appliance. The brushhead assembly is inserted into the opening, using the finger grips **34** on the outer brushhead portion **22**, positioning the outer brushhead portion so that pins **36** in the body **10** of the personal care appliance mate with the openings to the pin grooves **35** in the outer surface of the outer brushhead portion **22**. Pin and pin groove alignment is straightforward. Special alignment or orientation is not required. The outer brushhead portion **22** can be arbitrarily placed inside the opening in the appliance body **10** and then rotated until the pins **36** begin to engage the grooves **35**.

[**0034**] The outer brushhead portion is then rotated in a clockwise direction, which draws the outer brushhead portion **22** a distance inwardly, with the inner brushhead portion **24** moving along with it. As the outer brushhead portion **22** is drawn inwardly, the inner brushhead portion **24** encounters installation resistance of the hub **18**. When this occurs, the V-shaped upper surfaces **53** on the locking snap elements **50** axially align the inner brushhead portion **24** with the outer brushhead portion **22** and the snap elements **50** engage lip **57**-**57** of the outer brushhead portion **22**.

[**0035**] Further rotation of the outer brushhead portion causes legs **42** and **56** of the inner brushhead portion **24** to move into operative relationship with drive hub **18**. The geometry of the various parts is arranged with over-travel so that prior to the outer brushhead portion reaching the end of its rotational travel defined by the pins **36** in the pin grooves **35**, the inner brushhead portion **24** has been snugly fitted to the drive hub **18**. At the end of the rotational travel, the outer brushhead portion **22** is released, and the wave washer **12** tends to force the outer brushhead portion **22** slightly outwardly until the pins **26** on the appliance body **10** are positioned at the very end **35***a* of the pin grooves **35**. This last movement of the outer brushhead portion **22** provides the required operational clearance between the outer brushhead portion **22** and the inner brushhead portion **24**.

[**0036**] In this position, outer brushhead portion **22** is locked in a selected rotational position relative to inner brushhead portion **24**, and the upper bristle surface of the outer brushhead portion **22** is substantially coplanar with the upper bristle surface of the inner brushhead portion **24**. The bristles could be arranged, however, such that the bristle surfaces are in different but still parallel planes. While the outer brushhead portion **22** is now locked in position rotationally, the inner brushhead portion **24** is free to oscillate, surrounded by the outer brushhead portion **22**, driven by drive hub **18**. This arrangement thus has the important advantage of having both portions of the brushhead assembly, i.e. the fixed outer portion **22** and the movable inner portion **24** installed in the appliance in one operation.

[**0037**] To remove the complete brushhead assembly, it is only necessary to depress the outer brushhead portion **22** against the wire spring **12** action and rotate the outer brushhead portion counterclockwise. This action reverses the installation procedure. As the brushhead is rotated, the cam action of pins **36** in the pin grooves **35** drives the complete brushhead assembly outward. With continued rotation, the outer brushhead **22** comes free of the pins **36**, at which point the entire brushhead assembly can be removed, in one action, because the inner brushhead portion **24** is still joined to the outer brushhead portion **22** by the locking projections **53** on the snap legs **42** relative to the lip **57** on the interior surface of the outer brushhead portion.

[0038] Accordingly, a brushhead attachment system has been disclosed which can attach a brushhead assembly having two portions, one oscillating and one not oscillating in operation, to an appliance body with one installation action.

[0039] Although a preferred embodiment of the invention has been disclosed for purposes of illustration, it should be understood that various changes, modifications and substitutions may be incorporated in the embodiment without departing from the spirit of the invention which is defined by the claims which follow. For instance, while the cleaning member has been disclosed as bristles, it could be other arrangements, including various foam members, elastomeric members, etc.

What is claimed is:

1. A brushhead assembly attachment system for a personal care appliance, comprising:

a hub member adapted to be secured to a driven shaft of a personal care appliance, the hub member including a plurality of locking elements around the periphery thereof;

an outer brushhead portion having a first cleaning member extending therefrom, the outer brush assembly having a connecting structure for removably joining the outer brushhead assembly the personal care appliance; and

an inner brushhead portion having a second cleaning member extending therefrom, configured to fit with the outer brushhead assembly, wherein the inner brushhead assembly includes depending legs, at least some of which mate with the locking elements on the hub member, such that oscillating movement of the hub member results in similar movement of the inner brushhead member, wherein at least some of the depending legs are configured to removably latch onto a portion of the outer brushhead portion, providing a joining relationship therebetween, wherein the inner brushhead portion and the outer brushhead portion are configured relative to each other and to the hub member such that attaching the outer brushhead portion to the appliance body by means of said connecting structure results in both connection of the outer brushhead portion to the appliance body and connection of the inner brushhead portion to the hub member.

2. The attachment system of claim 1, wherein the first and second cleaning members are bristles.

3. The attachment system of claim 1, wherein the first and second cleaning members are foam.

4. The attachment system of claim 1, wherein at least some of the depending legs are configured to latch onto a portion of the hub member.

5. The attachment system of claim 1, wherein the outer brushhead portion is in the form of an annular ring and the inner brushhead portion is circular, fitting within the outer brushhead portion, and wherein the cleaning members on the first and second brushhead portions are in the same plane when the brushhead assembly portions are in place on the appliance.

6. The attachment system of claim 1, wherein the outer brushhead portion is in the form of an annular ring and the inner brushhead portion is circular, fitting within the outer brushhead portions, and wherein the cleaning members on the first and second brushhead portions are in different but parallel planes when the brushhead assembly portions are in place on the appliance.

7. The attachment system of claim 1, wherein the body of the appliance includes a plurality of extending pins in the opening for the brushhead assembly, and wherein the connecting structure in the outer brushhead portion includes a plurality of matching grooves therein for mating with the extending pins to secure the outer brushhead portion to the body of the appliance.

8. The attachment system of claim 7, wherein the grooves are arranged and configured to provide a small over-travel characteristic for the outer brushhead portion as the outer brushhead portion is installed by rotation of the outer brushhead portion, the grooves being further configured to permit a slight outward movement of the outer brushhead assembly under spring action when the outer brushhead portion is released.

9. The attachment system of claim 7, wherein the grooves are arranged and configured to aid in removal of the outer brushhead portion which in turn results in removal of the inner brushhead portion from its operative relationship with the hub member.

10. The attachment system of claim 1, wherein the depending legs of the inner brushhead portion includes a first set of spaced legs, each comprising split portions which can flex toward each other slightly, and which include latching elements on an outside surface thereof for latching onto a portion of the inner surface of the outer brushhead portion to temporarily secure the outer and inner brushhead portions longitudinally together while permitting rotational movement of the inner portion, wherein the latching portions are configured so that the inner brushhead portion can be inserted onto and removed from the outer brushhead portion by a user.

11. The attachment system of claim 10, wherein the depending legs include a second set of spaced legs alternating with said first set of legs, wherein the second set of legs mates with matching projections on the hub member in an interference fit to provide for rotational action thereof.

12. The attachment system of claim 11, wherein the locking elements on the hub member comprise a plurality of diamond-shaped spaced projections on the exterior surface of the hub member and are configured to provide an interference fit with the second set of spaced legs, and are further configured to provide a snap-type connection with the first set of spaced legs.

13. The attachment system of claim 12, wherein the exterior surface of the hub member on which the projections are mounted is slightly outwardly tapered so as to force the depending legs outwardly, increasing a secure fit between the depending legs and the hub member.

14. The attachment system of claim 1, wherein the outer brushhead portion includes finger grips spaced around an upper periphery thereof to aid a user in installation of the brushhead assembly onto the appliance.

15. The attachment system of claim 1, including openings in the hub member to permit additional air to reach the cleaning member in the brushhead assembly.

16. A powered skin cleansing appliance, comprising:

an appliance body;

a driving system in the appliance body for a brushhead assembly of the appliance;

a first brushhead portion of the brushhead assembly which includes a first cleansing member, the first brushhead portion remaining stationary in operation; and

a second brushhead portion which includes a second cleansing member, the second cleansing member oscillating through a selected angle by means of the driving system when the appliance is in operation.

17. The cleansing appliance of claim 16, wherein the selected angle is within the range of 8°-26°.

18. The cleansing appliance of claim 16, wherein the appliance has a frequency of operation within the range of 120-220 Hz.

19. The cleansing appliance of claim 16, wherein the first brushhead portion is in the form of an annular ring and the second brushhead portion is circular, fitting within the first brushhead portion.

* * * * *